SERIES 35-66 - 60730-2-5 Compliant

24 VAC Microprocessor-Based
Hot Surface Ignition Control with Inducer Blower Relay

F-35-66H
February 2024

FEATURES

- Single or Multiple tries for ignition (TFI)
- Multiple options for ignition period, pre-purge, and inter-purge timings
- 120/240 field selectable line voltage for use with 120 VAC igniter option
- 24/120/240 VAC hot surface igniter models available
- Diagnostic LED
- Local and Remote flame sensing
- Quick connect terminals or Mate-N-Lok connectors
- Integral Brass Standoffs or Enclosure available
- Available one-hour automatic reset
- Available UART output for digital communications
- Meets 60730-2-5 Harmonized Standard

APPLICATIONS

- Gas furnaces
- Boilers
- Commercial cooking
- Water heaters
- Other gas-fired appliances

DESCRIPTION

The Model 35-66 is a 24 VAC Microprocessor Based Hot Surface Ignition (HSI) Control designed for use in all types of gas-fired appliance where sparking is not desired. The control continually and safely monitors, analyzes, and controls the proper operation of the gas burner and inducer blower. A diagnostic LED and optional UART communications make troubleshooting easy and ensures safe and efficient operation.

The optional UART communications offers advanced diagnostic data and connectivity with the Fenwal ConnectedControl series 05-50 Wi-Fi device.

Agency Certifications

Design Certified to ANSI Z21.20-2014
CAN/CSA C22.2 No. 60730-2-5-14 14 and
UL 60730-2-5

RoHS Compliant

SPECIFICATIONS

Input Power	Control: 18-30 VAC 50/60 Hz (Class 2 transformer)
HSI Input Voltage	24, 120 or 240 VAC (L1 and L2 only)
Input Current	400(RMS) mA @ 24 VAC, gas valve relays energized @ 25°C
Gas Valve	2.0A @ 24 VAC 4.0A (Inrush)
Hot Surface Ignitor	5A @ 24/120/240 VAC
Inducer Relay	120/240 VAC 3.0/1.5 amps @ .6pf min.
Operating Temperature	-40°F to + 176°F (-40°C to +80°C)
Storage Temperature	-40°F to + 185°F (-40°C to +85°C)
Flame Sensitivity	0.7uA minimum
Flame Failure Response Rate	0.8 seconds maximum
Flame Failure Lockout Time	Varies by model, 315 seconds maximum
Gas Types	Natural, LP, or manufactured
Size (LxWxH) Board Only	5.5 x 3.75 x 1.5 inches (13.97 x 9.53 x 3.8 cm)
Size (LxWxH) with Cover	5.7 x 4.0 x 1.6 inches (14.45 x 10.15 x 4.1 cm)
Enclosure / Mounting	Noryl Gray Cover or Integral standoffs
Moisture Resistance	Conformal coated to operate to 95% R.H. (Non-Condensing) Always avoid direct exposure to water.
Ingress Protection	Not Rated, Protection provided by appliance in which it is installed.
Tries for Ignition	One or Three
Tries for Ignition Periods	4, 7, 10, or 15 seconds
Pre-purge and Inter-purge Timings	None, 15, or 30 seconds Without pre-purge, there is a 2 second start-up delay.
Heat Up Period	4, 6, 20, 40 seconds
Communication	Optional UART communication

SEQUENCE OF OPERATION / FLAME RECOVERY / SAFETY LOCKOUT

Power Up

During power up the Red LED shall briefly flash ON for around 1 second while the control performs a power on self test and then turns OFF to indicate normal operation.

Start Up - Heat Mode

When a call for heat is received from the thermostat, 24 VAC to TH, the control will check the pressure switch for normally open contacts. The inducer blower is then energized and, once the pressure switch contacts close, an optional pre-purge period begins. Following the pre-purge period, the Igniter is energized for the heat-up period, and then the gas valve is energized for the Trial for Ignition (TFI) period.

When the igniter is de-activated and flame is detected during the TFI, the gas valve and inducer blower remains on. The thermostat and burner flame are constantly monitored to assure proper system operation. When the thermostat is satisfied and the demand for heat ends, the gas valve is immediately de-energized, an optional post-purge period will continue before de-energizing the inducer blower.

Failure to Light - Lockout

SINGLE TRIAL MODEL

Should the burner fail to light, or a flame is not detected during the TFI period, the gas valve will de-energize and the control will go into lockout. The inducer blower will turn off following the optional post-purge period. The LED will repeatedly flash 3 times indicating the fault code for ignition lockout.

MULTI TRIAL MODEL

Should the burner fail to light or the flame is not detected during the TFI period, the gas valve will de-energize. The control will then go through an inter-purge delay with the inducer blower on before an additional ignition attempt. The control attempts two additional ignition trials before de-energizing the gas valve and entering lockout. The inducer blower will turn off following the optional post-purge period and the LED will repeatedly flash 3 times.

Flame Failure

If the established flame signal is lost from the burner, the gas valve is de-energized and the control proceeds to inter-purge with the inducer blower on before attempting to relight the flame. Multi-try models permit three tries for ignition including inter-purges. If the burner relights, normal operation resumes. If the burner does not relight, the control will enter lockout and the LED will repeatedly flash 3 times.

Lockout Recovery

Recovery from lockout requires either resetting the thermostat, or removing power for a period of 5 seconds. On models with automatic reset, if the thermostat is still calling for heat after one hour, then the control will automatically reset and attempt to ignite the burner.

Combustion Airflow Fault

Combustion airflow is continually monitored during an ignition and burn sequence by the pressure switch (PSW). If during the initial call for heat, the switch contacts are in the closed position (stuck closed) the blower will not start and after 30 seconds the diagnostic LED will flash a 1 flash pattern. The control remains in this state until either the PSW switch opens or the call for heat is removed. If the PSW opens operation continues from pre-purge.

If the PSW remains open after the blower has been energized for 30 seconds, the diagnostic LED starts flashing 1 flash for air flow fault. This state persists for the defined Air-fault Lockout delay if the PSW does not close. When the Air-Fault Lockout delay expires, the blower shuts off and the control enters Lockout (3 flash). The control remains in the lockout state until either the thermostat or power is removed; and if enabled, an auto-restart restarts the startup sequence.

When the PSW closes after blower activation, any interruption to the PSW results in an indication of air-flow fault and the Air-fault lockout timer starts. Recovery of the PSW prior to Lockout Timer expiring will restart the ignition sequence with an interpurge time delay.

MOUNTING AND WIRING

The 35-66 is not position sensitive and can be mounted vertically or horizontally. The control may be mounted on any surface and fastened with #6 sheet metal screws. The control also supports direct mounting to a standard 4-in. junction box. Secure the control in an area that will experience a minimum of vibration and remain below the maximum ambient temperature of 176°F (80°C). All connections should be made with UL approved, 105°C rated, 18 gauge stranded wire with .054" minimum insulation thick-ness. Refer to the appropriate wiring diagram when connecting the 35-66 to other components in the system.

Remote Sense Cable Requirements

Remote flame sense cable must meet a voltage rating of 250V and an insulation rating of 200 °C or higher. Recommended length of 10ft (3m) or less. Consult Factory for longer lengths. Refer to Fenwal Controls datasheet F-05-1000 for details.

CAUTION	**Label all wires prior to disconnection when servicing or replacing controls. Wiring errors can cause improper and dangerous operation. A functional checkout of a replacement control should always be performed.**
CAUTION	**The control must be mounted and located in a manner which protects components from exposure to water (dripping, condensate, spraying, rain). Any control that has been exposed to water must be replaced.**
WARNING	**All wiring must be done in accordance with both local and national electrical code, and by a trained service technician. Wiring must be at least #18 AWG /AWM rated for 105°C or higher.**
WARNING	**The 35-66 uses voltages of shock hazard potential. Wiring and initial operation must be done by qualified service technician.**
WARNING	**Operation outside specifications could result in failure of the Fenwal product and other equipment with injury to people and property.**
WARNING	**Do not disconnect any electrical loads while the automatic gas ignition control is powered. Disconnect power prior to installation, service, or replacement of the control with the end use appliance.**
WARNING	**RISK OF EXPLOSION OR FIRE** **The 35-66 control cannot be serviced by the user. If any control faults are detected, the 35-66 control must be replaced by qualified service personnel. Risk of explosion or fire can result if the control module has been opened or with any attempts to repair it, and voids the warranty.** **Do not use aluminum wire, this can also lead to risk of fire.**

TERMINAL DESIGNATIONS

Name	Description	Terminal Type
F1	Inducer Power	1/4" male Q.C. (or 2-pin Mate-N-Lok, P2-1)
F2	Inducer Output	1/4" male Q.C. (or 2-pin Mate-N-Lok, P2-2)
R	24 VAC Power	1/4" male Q.C.
S1 240	240 VAC Ignitor	1/4" male Q.C.
S1 120	120 VAC Ignitor	1/4" male Q.C. (or 5-pin Mate-N-Lok, P4-5)
L1	120/240 VAC Input (Hot)	1/4" male Q.C. (or 5-pin Mate-N-Lok, P4-4)
L2	Neutral	1/4" male Q.C. (or 5-pin Mate-N-Lok, P4-2)
S2 / FS	Ignitor / Remote Flame Sense	1/4" male Q.C. (or 5-pin Mate-N-Lok, P4-1)
TH/W	Thermostat Input	1/4" male Q.C.
PSW	Pressure Switch Input	1/4" male Q.C.
MV1	Main Valve Power	3/16" x .031" male Q.C.
GND	Ground	3/16" x .031" male Q.C.
P3	Serial Coms TX, RX, Gnd	0.025 pins 0.1 centers
P2	Remote Diagnos-tic LED K, A	0.025 pins 0.1 centers

Communications

A communications option is available. Asynchronous serial with 5v single level swing. Consult factory for details.

WIRING DIAGRAMS

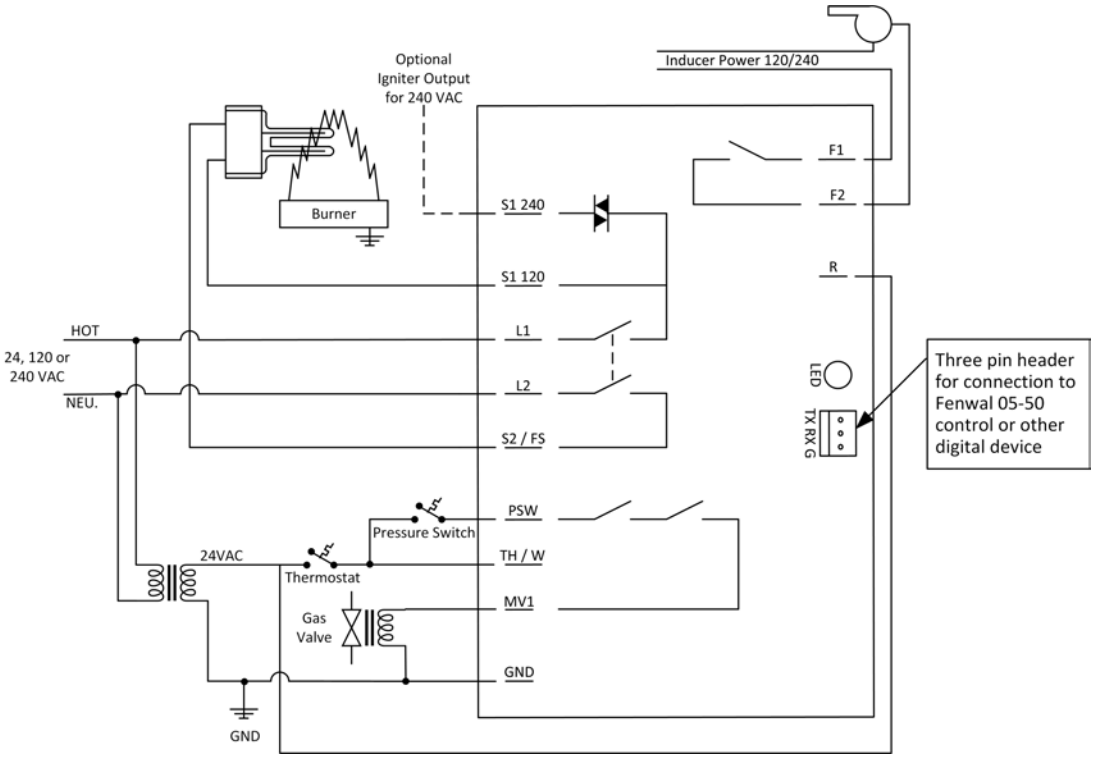


Figure 1. Local Sense

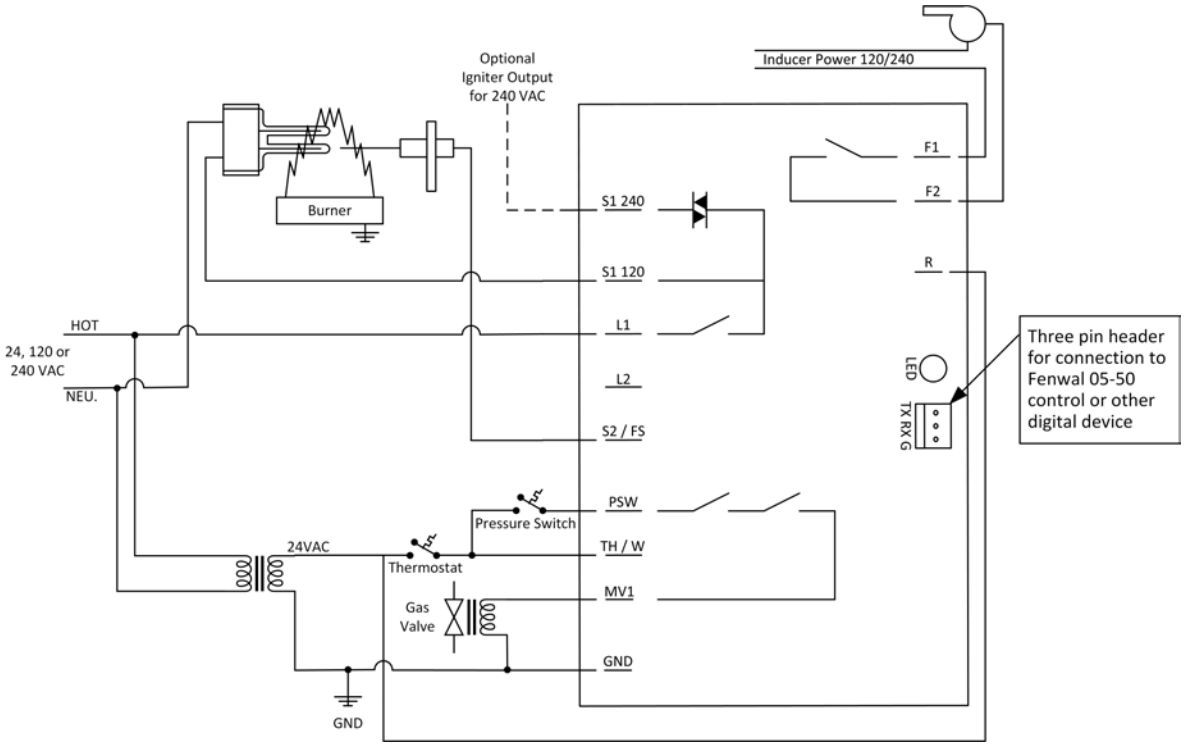


Figure 2. Remote Sense

DIMENSIONS - INTEGRAL STANDOFF

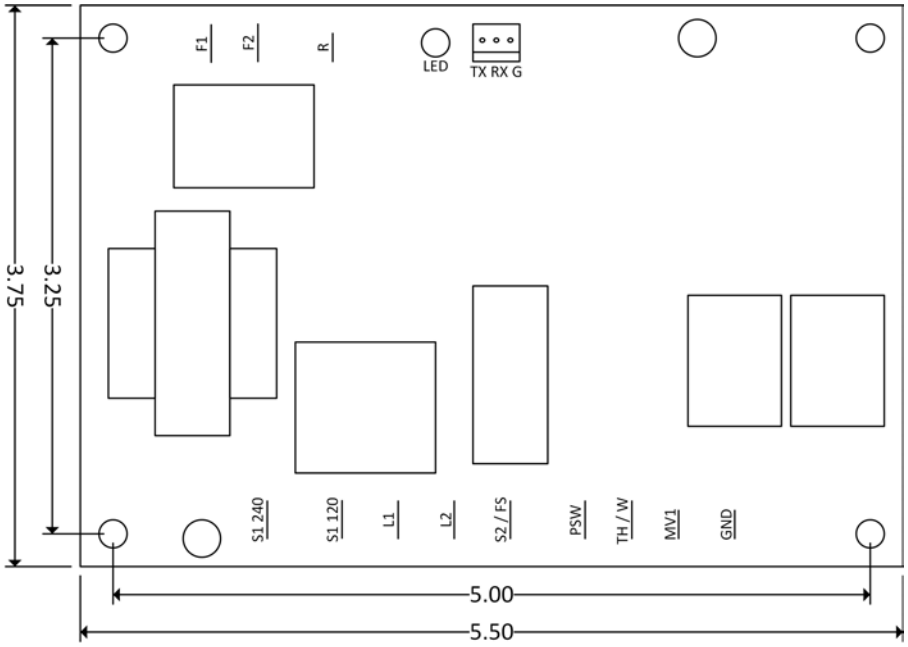


Figure 3. Board Only

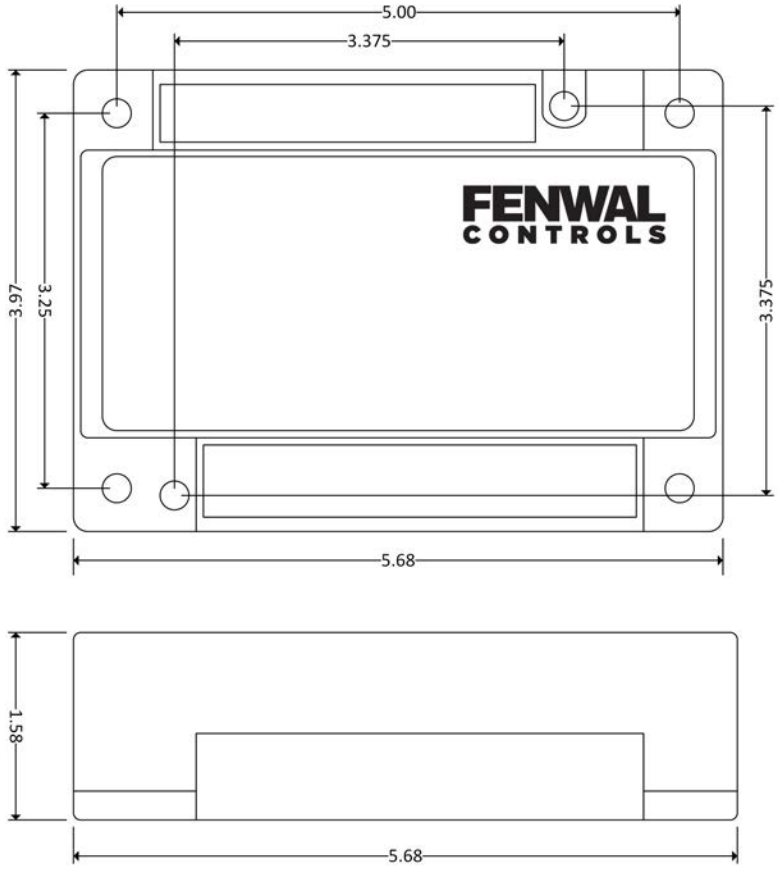


Figure 4. Control with Cover

TROUBLESHOOTING

Troubleshooting Guide	
Symptom	**Recommended Actions**
1. Dead	A. Miswired B. Transformer bad/battery fault C. Fuse/circuit breaker fault D. No voltage at PWR E. Faulty control
2. Thermostat on - no ignition	A. Miswired B. Faulty thermostat, no voltage at thermostat terminal W C. Failed igniter
3. Inducer blower on - no TFI after purge delay	A. Miswired B. Flame fault C. Airflow fault D. Faulty control
4. Valve on - no igniter	A. Miswired B. Defective igniter C. Open S1 cable D. Faulty control
5. Igniter on - no valve	A. Valve coil open B. Open valve wire C. Faulty control (check voltage between MV1 and GND)
6. Flame okay during TFI - no flame sense (after TFI)	A. Faulty igniter B. Faulty S1 wire C. Poor ground at burner D. Faulty control (check flame current)

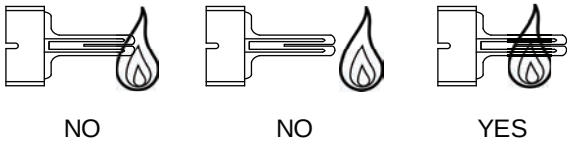
Diagnostic LED Fault Conditions	
LED Indication	**Fault Mode**
Off	Standby & Normal Condition
Steady On	Internal Control Failure
1 Flash	Airflow Fault
2 Flashes	False Flame
3 Flashes	Ignition Lockout
5 Flashes	Weak Flame Detected

Note: During a fault condition, the LED will toggle on for 100ms and off for 300ms as needed to indicate fault code. The code will repeat every 3.2 seconds. Removing power from the control clears the fault code.

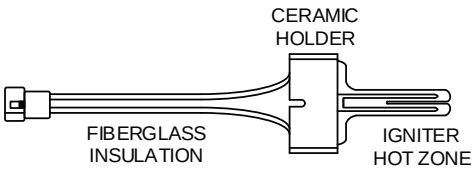
Hot Surface Igniter

Proper location of the silicon hot surface igniter is important to achieve optimum system performance for both ignition and flame sensing. See figure below.

Note: The temperature of the ceramic holder should not exceed the manufacturer's specifications.



Typical Hot Surface Igniter



Flame Current

Flame current is the current which passes through the flame from the sensor to ground to complete the primary safety circuit.

A good burner ground that matches the control ground is critical for reliable flame sensing.

A 5 LED flash code is an indicator of a weak flame. Flame strength can also be measured through the UART connection. Consult Fenwal for further information.

Internal Control Failure

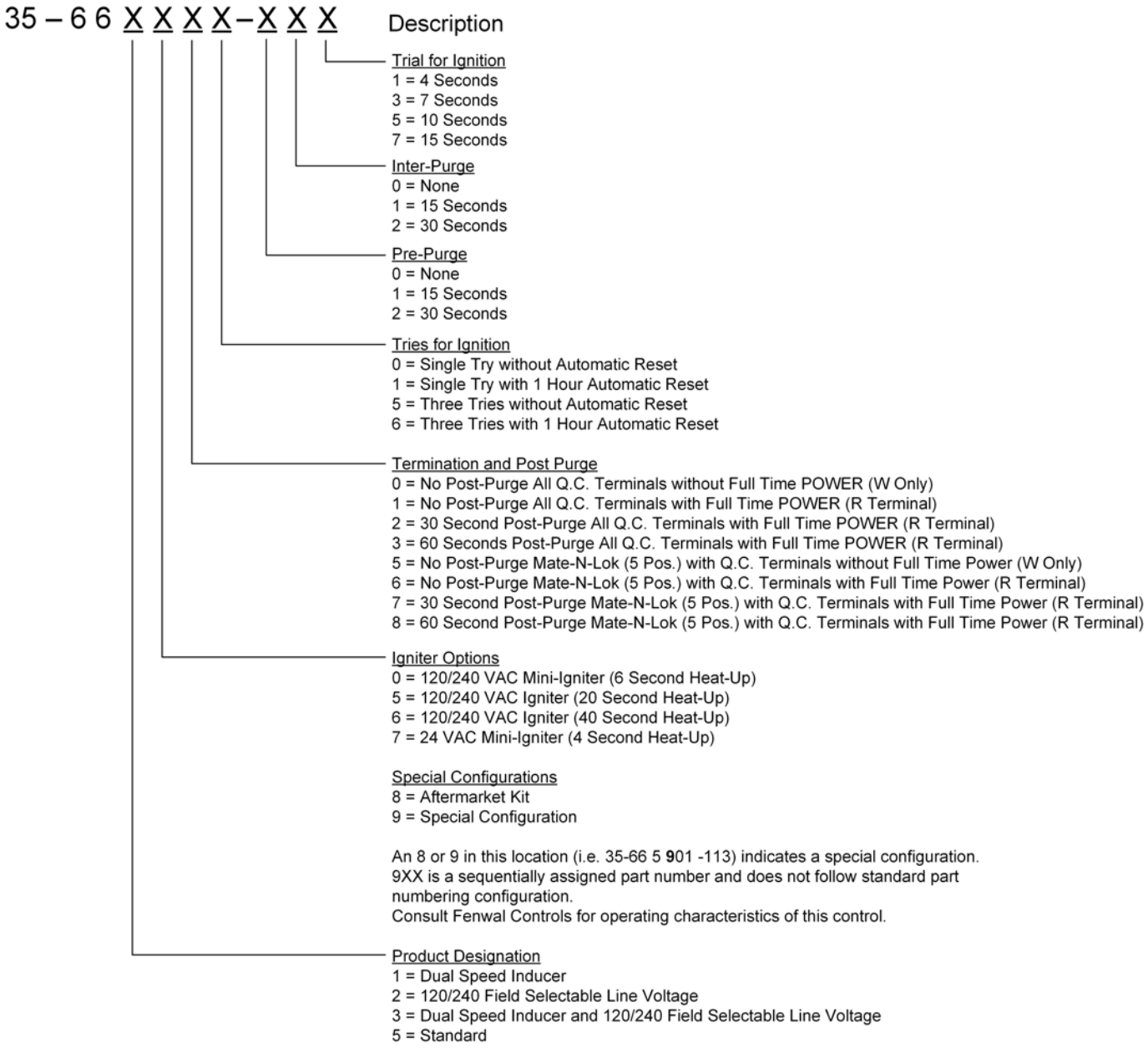
If the control detects a software or hardware error, all outputs are turned off. If this condition persists after an attempt to restart, then the control must be replaced.

Note: The control can only be replaced with the same model type control.

Disposal

Do not discard in trash, recycle per local guidance.

PART NUMBER CONFIGURATION



35-665999-XXX Utilizes Fenwal Control's advanced Option ID # for additional options. Please consult fenwalcontrols.com or the factory for further information

35-6659XX-XXX Special configuration, consult Fenwal Controls for operating characteristics.

Consult Fenwal Controls for operating characteristics of this control.

EXPORT INFORMATION (USA)
Jurisdiction: EAR
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Fenwal Controls, Kidde-Fenwal Inc.
400 Main Street
Ashland, MA 01721
Tel: 800-FENWAL-1
Fax: 508-881-7619
fenwalcontrols.com